DOCUMENT RESUME

ED 267 730 IR 011 998

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TITLE Educational Microcomputing at Home: A Comparative Case Analysis of Twenty Families with Children.
SPONS AGENCY National Inst. of Education (ED), Washington, DC.
PUB DATE Jun 84
CONTRACT P-84-0020
NOTE 29p.; Paper presented at the Conference on Computers in the Home (Washington, DC, June 7-8, 1984). For a related paper, see IR 011 999.
PUB TYPE Reports - Research/Technical (143) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS *Adoption (Ideas); Attitudes; Case Studies; Children; Computer Assisted Instruction; Computer Software; *Family Environment; Family Involvement; Family Life; Information Retrieval; *Microcomputers; Programing; Tables (Data); Technological Advancement; *Use Studies; Word Processing

ABSTRACT

This paper presents the first comparative findings emerging from 20 individual case studies into the adoption, use, and effects of microcomputers in families. The 20 families are first described according to a number of key demographic characteristics--socioeconomic, nationality, parent occupations, number and ages of children, etc. An examination of the dynamics behind adoption of this technological innovation and the extent to which educational goals played a major role in the adoption process follow. The report then focuses on the use of the home microcomputer by children in these families and attempts to determine: (1) the ways in which the children are engaged, if at all, in educational microcomputing, and (2) why their educational microcomputing takes the form(s) it does. The paper ends with a discussion of the potential future aspects of the relationship between family and school if the use of microcomputers for educational purposes by children at home continues to grow. Additional topics addressed include computer programming as the dominant educational activity and the resistance of family members to the use of professionally prepared educational software. A list of references is provided. (JB)

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ED267730

Educational Microcomputing at Home: A Comparative Case Analysis Of Twenty Families with Children[1]

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A paper to be presented at the Conference on Computers in the Home: New Opportunities and Challenges for Education. Sponsored by the National Institute of Education, June 7-8, 1984 in Washington, D.C. The completion of this paper was funded by NIE Contract P-84-0020. The study reported here is part of a larger project: Studies of Interactive Technologies in Education (SITE) now underway in the School of Education, Health, Nursing and Arts Professions and is made possible by an initial grant from Scholastic, Inc.

IR011998

INTRODUCTION

The purchase of microcomputers by different kinds of organizations, large and small, continues to move at almost breakneck speed. And, while not all of the speculations about their immediate or eventual consequences are positive[2], anticipations among many are running high. As one might expect, speculations out distance our knowledge about the realities, especially in such settings as the family.[3] The successful introduction of technological innovations and the subsequent effects of such innovations on social units such as the family have been topics of long standing among social scientists. One of the current assumptions held is that the purposeful adoption and introduction of new technologies assures neither the nature of their subsequent use nor their continued implementation[4]. Another assumption of longer standing is that technological innovations have the effect of altering the underlying social structures of those settings in which they are used[5].

This paper presents the first comparative findings[6] emerging from 20 individual case studies into the adoption, use, and effects of microcomputers in families. The paper is organized in the following way. First, the twenty families are described according to a number of key demographic characteristics. An examination of the dynamics behind adoption of this technological innovation and the extent to which educational goals played a major role in the adoption process follow. The paper then focuses on the use of the home microcomputer by children in these families and attempts to answer two questions: In what ways are children engaged, if at all, in

educational microcomputing? And, why does their educational microcomputing[7] take the form(s) it does? The paper ends with a discussion of the potential, future aspects of the relationship between family and school should the use of microcomputers for educational purposes by children at home continue to grow.

The fieldworkers were doctoral students at NYU's School of Education, Health, Nursing, and Arts Professions. As part of their training in the use of ethnographic fieldwork methods, they were asked to find a family having a microcomputer at home, preferably a family with children so that the use of the personal computer for educationally-related purposes could be examined (if this was occurring)as well as its use and effects in other areas. It should be noted, however, that families were not selected on the basis of the presence of educational microcomputing. Their field activities were carefully monitored. Because they lived in widely diverse areas and had to choose families within a reasonable commute for repeated observations and interviews, the families themselves were located throughout a tri-state area including Western Connecticut, upstate New York, Westchester and Rockland Counties, Long Island, and the other boroughs of New York City as well as Manhattan[8].

THE FAMILIES AND THEIR HOME MICROCOMPUTERS

Although they came from widely disparate locations, the families are clearly middle or upper-middle class. All are Caucasian save for one Jamaican, one Korean, and one Latino family. Nearly all fathers are college trained with occupations ranging from physician, engineer, corporate manager, business owner, and professor to

public school administrator and computer expert. The mothers are also well educated with about half of them currently full-time homemakers. In 18 of the 20 families, the mother and father are present; in the remaining two families, one father is deceased, the other is not living at home.

Most families have two or three children. Several have as few as one or as many as four. Nearly 40 children, most in elementary or secondary schools, were involved. Parents are largely in their 30's, some in their 40's.

The majority of these families (14) have either an Apple IIe, a Commodore 64, or a TRS80. The remaining six have other computers such as the Franklin Ace 1000, IBM PC, T.I, Vector Graphics, or VIC 20. Eighteen of the 20 have one computer; the majority were purchased during the past two years. Several families had had an earlier multiple-use micro and replaced it with a newer, more versatile model. In three families, two micros are present. Ancillary hardware for some include disk drives, video screens, and printers. Others have joy sticks; some use cassettes rather than floppy disks. One has a modem. Quite a few are hooked up to a family TV set, though not the majority. Most are located in the major-user's bedroom or in a spare room. Several, however, are placed in living or family rooms. One is on a roll-away stand in the kitchen. Many families are planning to purchase additional hardware such as printers, disk drives, more memory, or a better CRT.

Software for educational purposes will be discussed in greater detail later. But overall, the largest proportion of software packages is in the form of games.

Though the amount of game software in the below fieldwork report may be on the high side across the 20 cases, nearly all families have software of this type.

> Since Sn1 bought the commodore with his savings, it is located in his room...Most of the software consists of games that came on the original disk with the computer and games or musical/visual programs that Sn1 entered from magazines or books. I actually witnessed several of these programs being used. 'Jotto', a word guessing game, 'Lemonade', a game based on profits and losses of a lemonade stand, 'Airaid', 'Let's Bomb Buffalo', 'Clock',...and 'Pac-Man'. Some of the musical/visual programs included a hot air balloon display with colorful, moving balloons and a mouse that tap-danced across the screen...Sn1 invented a game called 'Spongecake' which Sn1 programmed...I noticed that when he displayed the list of what he had stored on the disk, Sn1 had many other programs which I never witnessed being used. (C Report, pp. 13-14)
>
> [For all excerpts: Fa=Father; Mo=Mother; Sn=Son; Da=Daughter; If more than one son (or daughter), then a(number e.g., Sn2) was added]

PATTERNS OF AND PURPOSES BEHIND THE ADOPTION OF HOME MICROCOMPUTERS

The dynamics behind the adoption of these microcomputers varied enormously. In some families it was a "simple" matter such as a single parent deciding on his or her own to get one and to bring it home, as one field researcher describes.

> Two years ago, Fa's department at work became computerized. Since he had no formal training in computers, he decided to bring home an Apple II from the office, 'just to play around with', according to Mo. Fa has always had a fascination with 'gadgets' or the latest technological fad. They have acquired a fair amount of these high-tech machines such as tape decks, Atari, micro-wave oven, turbo-convection oven, a CB, stereos, five TV sets, and a food processor. Fa also thought it would be good for Sn to have some experience with the computer after he had expressed such an interest. (J Report, p. 7)

At the other extreme, adoption in some families was the result of a concatenation of many key events and family activities occurring over a long period of time and involving many outside individuals "pressing on the family":

> The PC is a Commodore 64...How this PC arrived [this past Christmas] is not as simple as explaining the arrival of the 3 wise men at a manger...Getting the PC into the house [was] like a time-release capsule. The immediate family members and outside influences worked away at Fa, the hard case, over a period of about 2 years. Each came at different times, overlapping and finally working together to dissolve away any reservations or resistance...
> (B Report, p. 6 and appendices)

Too complex to present in the space available, the actual process the above family went through involved (1) close, but out-of state, friends, (2) neighbors, (3) a distant aunt, (4) a nearby uncle with considerable prior microcomputing experience and (5) school activities related to personal computers.

A third pattern, not as complex as the last and this time involving the school as the central force, is outlined by another fieldworker:

> September 1982. The elementary school had purchased computers. [Mo and Fa] begin to discuss the possibility of buying a home computer as an educational tool for the children.
>
> August through September 1983...They see ads and commercials but make no decision.
>
> September 1983. Snl enters 5th grade and his teacher is the school's computer teacher.
>
> October 1983. Mother sees son's teacher and teacher mentions that [he] is doing well, and is really good on computer. The suggestion that he would benefit from having one in the home is made.
>
> November 1983. Discussions [within the family including the children] about computer purchase and investigating the purchase take place. Decision to purchase for Christmas is made.
>
> Early December 1983. The family shops around and finds that the computers in the stores are selling out. A decision to buy [the Commodore 64] now is made to avoid the possibility of not getting one in time for Christmas.
> (F Report, pp. 12-13)

Although the dynamics behind adoption varied from simple to complex, the final decision appears to have been either imposed at the top by a parent or parents, arrived at democratically with the real participation of children, or "made at the grass roots" by one or more children and then supported by the parents.

An examination of the reasons emerging from the interviewing of family members suggests that why microcomputers were adopted varied as much as how they were. Still, in seven of the twenty, adoption of the microcomputer was primarily for educational or school-associated reasons. (See Table 1). As one fieldworker put it:

> Family members reported that the Commodore was requested by the older son...after being exposed to computer education as part of his eighth grade science curriculum...the family (mother and father) reported purchasing the computer for the sole purpose of enhancing the older son's education, and it was regarded [as] 'an investment in his future'.
> (A Report, pp. 6-7)

Another described the educational reasons behind the adoption of a Commodore 64 this way:

> Fa acknowledged that he bought the computer because Sn was getting up at 6:00 a.m. at the beginning of the school year to get into school at 7:00 a.m. to use the school terminal. Fa wanted Sn to be able to use the microcomputer at his leisure at home.
> (E Report, p. 9)

The following reflects the importance education played in the eventual adoption of an Apple IIe in still a third family:

> The computer idea was born in a fourth grade math class unit on computers. When in fifth grade, Sn became quite interested...They worked on a Bell and Howell 'clone' with a terrific teacher who inspired Sn...Sn began creating programs in school, advanced his skills and soon the first computer was updated to an Apple 2E...For this family, the computer was intended to be a 'learning tool' to stimulate and provide intellectual enrichment and enjoyment.
> (D Report, pp. 5,6,7)

Table 1. The Major Purpose for the Microcomputer's Adoption, Whether It is Presently Being Used, and Whether One of Its Present Uses is for Education (N=20)

Major Reason for Adoption		Type of Micro	Is It Still Being Used?	Is One Use, Educational?
1. Education				
	Family A	"64"	YES	YES
	B	"64"	YES	YES
	C	"64"	YES	YES
	D	"IIe"	YES	YES
	E	"64"	YES	YES
	F	"64"	YES	YES
	G	Franklin	YES	YES
2. Work or Business				
	Family H	TRS80	YES	YES
	I	Not Known	NO	-
	J	"IIe"	YES	YES
	K	TRS80 (2)	YES	YES
	L	IBM pc / VIC20	YES	YES
	M	IBM pc	YES	NO
	N	"IIe"	YES	YES
	O	Vector Graphics	YES	NO
	P	TRS80	YES	NO
	Q	"IIe"	YES	YES
	R	"IIe"	YES	YES
3. Entertainment or HiTec Interest				
	Family S	VIC20	NO	-
	T	TI	NO	-

In the other 13 families, adoption of the microcomputer was essentially unrelated to school. In five cases, the reason was related to home business, in six to work, and in the remaining two to entertainment or technological interest. An example of home-business adoption is reflected in the following fieldworker's writing:

> This was how the idea of setting up a business with a computer came to them. They thought that a billing or an inventory system would be a feasible idea to offer. They believe that once the business is well on its way with enough clients that a profit is made and it covers her salary, she will be able to stay at home and work from there. They mentioned that the main reason they bought the computer was to serve as an additional source of income and so that eventually she could resign from her job and be more at home.
> (P Report, p. 5)

Illustrative of the work-related motive is the following entry by another fieldworker:

> Fa, the original mover and shaker behind this whole thing, uses the computer about an hour per night, six days per week, and for about five hours Sunday evening. He chiefly uses an agenda program and a word processing program. The agenda program is an electronic datebook...the word processing program allows him to work on short reports using data he has accessed from the mainframe at work instead of having to give them to a secretary.
> (R Log, p.7.53-55, 8.1-13)

A final description reflects the technological-fascination motivation of a father in another family.

> The overall reason for purchasing so much technology is simply because he enjoys it. As he said himself, 'I happen to be a sucker for gadgets'... He bought the Texas Instrument simply because he wanted to learn how to use a computer; he wanted to get over his intimidation of them in the privacy of his home.
> (T Report, pp. 12,13)

One further point about adoption. The motivations of parents were not always simple or altruistic. One father's hopes were put by a researcher this way:

> Fa (the father) felt that getting Sn (the son) the computer would bridge a gap between them...Buying the computer for Sn had a threefold purpose: (1) being symbolic of himself as being ever present; (2) relief of guilt for not being able to be there as often; and (3) hoping that he and Sn would have something they could work on together which would not only make them closer, but would aid Fa as eventually he needed to learn how to use the computer for his work. (G Report, p. 15)

Another researcher uncovered a seldom acknowledged motivation of a mother:

> ...she saw the computer as a tool which could give her the opportunity to have some time to herself. After Fa bought the computer, he spent time with the children using it. Since she feels a lack of time for herself, she decided not to use the computer so that she could have some peace and quiet by herself when Fa, Sn, and Da used the computer together. (T Report, p.16)

Still other parents had hopes which included a son's writing lucrative, game software and a daughter becoming interested in something other than T.V.

THE EDUCATIONAL USES OF MICROCOMPUTERS AT HOME

Prior to discussing the forms of educational microcomputing found within these families, specification of who is using microcomputers is in order. In three families (I,S,T), no one is using it; the latter two, having stored theirs, expect to buy a more advanced model in the future. In three more families (M,O, and P)an adult uses the micro almost exclusively for making money. They either do not allow their children to use it or they simply do not encourage them to use it. Included in the remaining fourteen families are the seven families where adoption was for educational purposes; in these homes the micro is still being used and for educational reasons. Moreover, in seven families where adoption was primarily for work or business, at least one child is using the micro for educational purposes as well.

In three of these fourteen families (D,G,J), the one child living at home (all boys) uses it. A fourth family (L) has two girls, but, since the younger is only four, the older (seven) is the major user, and for obvious reasons. In the Q family, both the sister and the brother are using the micro about equally. In the remaining nine settings, where there are at least two and sometimes three possible main users, one of the children is identified as being the major micro user. In seven of the nine (A, B, C, E, F, H, K) it is the first born: four boys and three girls. In the remaining two (N,R),

it is the second born, both boys in families where the first born is also a boy. It should be noted that in the majority of families with two or more children, one of the children shows little or no interest in educational microcomputing, and more often than not, outright hostility or rejection.

First impressions from logs and reports suggest that how parents relate to their children over educational microcomputing also varies considerably. Although the involvement in their children's educational and other microcomputing activities will need careful analysis, it appears that parents fall into one of four types: those who "stand over" their children and give direction; those that "stand by" their children in case they need help or direction; those that "stand by wringing their hands" hoping things will work out; and those that simply "stand aside", allowing their children maximum leeway to do what they want.

It is clear that most of the parents are hoping exposure to educational home computing will foster their children's achievement at school and in fact put them at an advantage in their competition at school and eventually at college and the world of work. But, it is also clear parents fear their children will become "hooked on computers" and as a result abandon friends, other important interests,

> ...the mother reported some initial misgivings about the amount of time her son used the computer when it was first bought. She expressed concerns with his becoming isolated with it, adding that Sn had wanted the computer kept in his bedroom, which she would not allow.
> (A Report, pp.9-10)

The microcomputer in this family is on a roll-away stand in the kitchen!

Another illustration of this fear is found in a family where the parents feel that any activity can be taken to an extreme. The field researcher put it this way:

> Mo and Fa are both wary of Da1 and Da2 being too involved in any single activity. Their decision not to buy video games for the VIC was partially based on the fear that the children would become addicted to games and that the computer would then serve a recreational rather than an educational function.
> (L Report, p. 11)

> Both...are concerned that their children could become hooked on one thing whether that be sugar, games, or TV...Fa and Mo monitor their behavior and set rules to discourage them from concentrating exclusively on any one activity or behavior.
> (L Report, p. 15)

In support of this philosophy, the VIC 20 is stored in a cabinet in the living room and the mother hooks it up to the TV when the children want to use it. This makes unlimited availability impossible.

What are the ways children engage in home educational microcomputing in the fourteen families where this kind of activity is occurring? Initial content analysis and quantification suggest that home educational microcomputing has taken essentially four forms. Ranked according to how central they are to a child's microcomputing, they are:

1. Programming: learning about the micro and software necessary for programming; learning how to program with a language, usually BASIC; actually programming.

2. Word processing: composing and/or typing school papers; storing class notes.

3. Using professionally-prepared, instructional software to learn math, reading, and other subjects/skills.

4. Accessing information from data sources or communicating with others in order to carry out school assignments or educationally-related tasks.

Table 2 demonstrates graphically that "programming as educational microcomputing" takes center stage. In the vast majority of cases, 11 out of 14, programming (or learning how to program) is foremost in the educational microcomputing activities of children in these families. Trailing a distant second is word processing of school papers or class notes. Only children in a few families are using educational software prepared by professionals to learn school subjects and skills. It is important to note that in Family Q, where the greatest stress is being put on learning school subjects like reading, spelling, and math with professionally-prepared software, the children do not program. This case represents a striking contrast to what is happening in other families and will be dealt with later in some detail.

A description of typical home programming activities is contained in the following field worker report:

> Sn owns the computer. He refers to it as 'his', and spends an average of eight hours a week working on it. He uses it mainly for the computer course at school and for playing games with his friends...Sn's high school offers four semester courses in computer science. The school has a limited number of computers. Sn believes that there is not an adequate amount of time for students to work on programming on the school's computers. When asked how he thought it was for students who did not have computers at home, Sn answered, 'They just can't compete---if they don't have the time and patience to spend with the machine, and there are only eight computers for 120 kids who are in the computer courses.
> (J Report, pp. 9-10)

Table 2. Dominant Educational Microcomputing Activities in the Home (N=14)

Activity (Rank Ordered)	The Families In Which It Occurs
1. Programming	A,B,C,D,E,F,G,J,K,L,N (N=11)
2. Word Processing of School Papers and Classnotes	D,H,K,Q (N=4)
3. Using Professionally-Prepared Instructional Software	Q,R (N=2)
4. Telecommunicating for Information used in School	D (N=1)

NOTE: The letters have the same reference to families as they do in Table One. This initial analysis reveals that in several homes, more than one educational microcomputing activity is important. For those families, their letter is placed in more than one appropriate category. Moreover, while several families, for example J, had purchased professional software, its use was simply too sporadic to justify placing them in category three (even though the proper use of these materials as few as they were would have been quite timely in the school experiences of several children).

From another fieldworker's report comes this description of programming:

> Sn2 characterizes his use of the computer as 'creative'. His interest in the computer is strong and ongoing... In a visit to his computer class, I observed that he found new logical statements to accomplish the task his teacher presented. He said to...his teacher...'I have altered your program a little, but I think it will work... In a comparison of his own computer use with that of [his brother] he said, 'Sn1 uses it the most but he just takes advantage of it--he really doesn't know how to use it. I'm more skilled at it; I made a program and used it; I made a game and played it'.
> (N Report, pp. 22-24)

One rare activity, educational telecommunicating, is perhaps to be expected because of the need for such things as a modem, knowledge about telecommunications, and a separate phone line. In the segment that follows, the field researcher is talking with the parents while they reflect on this educational microcomputing activity of their son:

> ...see the way he communicates with people all over the place...tonight he had a paper to do, so he keyed into the subject into his compuserve located in Virginia (the son interjected, New Hampshire with a chuckle). Fa then explained how in our day we would have to go to the library and look it up in a card catalogue, and get four books out and different sources...
> (D Log, p. 42.13-19)

Although telecommunicating and word processing are at this point exceptions, it does not seem extreme to have expected far more parents to have a tually purchased reading, writing and math programs as well as other substantive and skill-development software and to have started their children on home learning, which would buttress as well as parallel what was happening at school. With

some exception, this did not happen. Rather lengthy passages from the researcher's log make clear what this form of educational micro-computing was like in Family Q. In the first excerpt, the field-worker had asked the mother about the kinds of practicing her daughter and son did on the computer:

> Mo replied that Da practices her reading and mathematics lessons...and that the lessons on the disk are similar to the material that she is doing in school. I asked, 'How do you know what work Da is doing in school?' Mo replied, 'I know exactly what each of them (meaning Da and Sn) are doing in school because I make it my business to know!' She continued on and explained that prior [to] purchasing the software, she met with each of their teachers and obtained the information relative to their curriculum in mathematics, reading and spelling...I asked if each of the children had a schedule that they followed in getting to use the computer. Mo replied, 'Each one of the kids has a schedule both for doing school work and fooling around with the games'.
> (Q Log, p. 9.10-17, 9. 25-28)

In a later field visit, the researcher asked the daughter about her feelings toward the things her mother had her doing on the micro at home:

> She described that the program that her mother had obtained on math and reading was good and it seemed to help her in her classwork. I asked her to detail exactly how the software material helped her in class that her mother had obtained. She said, 'Well for one thing, I am always ready in class because I practice at home'. She also indicated that she likes to be at the top of the class because some kids come to depend upon her for help.
> (Q Log, p. 18.39-46)

WHY IS PROGRAMMING THE DOMINANT EDUCATIONAL MICROCOMPUTING ACTIVITY ?

The data analysis, which has been conducted so far, suggests that there are or may be a number of factors leading to the choice of programming and not the use of professionally-prepared educational software as the important home educational microcomputing activity[9]. In their general form, many of these conditions are found to be correlates of the use or implementation of innovations in large-scale organizational settings such as businesses, hospitals, and universities as well. [10]

The Receptivity of Family Members to Programming

The logs and reports of fieldworkers make one condition quite clear: many of the children and parents in these families are very receptive to the idea of programming. For example, when the one brother in the N family (as presented on page 13) says of the other brother that (to paraphrase) "he uses it the most, but I know how to be creative with it," the value of programming as a creative and hence desirable activity stands out. The belief that programming makes one more logical or rational is another force behind the high valuation of programming in still other families. In the passage that follows, a father compares programming to word processing:

> Both Fa and Mo wish that the schools would teach computers, but Fa is adamant that it must be programming. He says 'We know this is the real fascination of the...computer. Word processing is just an application. You have to go back to the raw capability of the computer'. He talked about how it refines thinking, that he can read op ed pieces now and clearly see logical errors.
> (K Log, p. 57.38-45)

The belief that with programming goes success in school, college, and the world of work also is a theme of importance among these families.

The School's Positive Emphasis on Programming

A second reason why programming may be the dominant educational activity at home is related to a key environmental pressure on the family. The schools attended by many of the children appear to be attaching great importance to this activity. Programming, the essence of many computer courses as they are often called, has been made an object of serious study in-and-of itself in schools.[11] These courses often stretching over several semesters are frequently associated with math and science departments, themselves highly valued. Taught by one or two "innovative" teachers, programming is treated as something special. So, another part of the answer to why programming is the premiere home educational microcomputing activity, is that many schools are treating it this way and that this is the message children are bringing home.

The Stability of Home-School Relations Over Programming

As noted above, in many schools the use of microcomputers and programming have become wedded and embedded in courses or class units of instruction. So, given that programming is essentially another course in the school's curriculum, the home and school can relate to each other over programming in exactly the same way they have over other subjects. This consistency of pattern (inter-organizational stability) may make the use of micros at home for programming easier for parents and children since their roles really do

not have to change. As the innovation is now embedded in schools and homes, little real organizational change in either setting is necessary. Parents can continue to show the level of interest and involvement in their children's schooling that they have in the past. Some continue to be centrally involved; others, probably the majority -- out of indifference, ignorance, fear, or time constraints -- will continue to leave the "computer" teaching up to the school, computer camps, private tutors, or to their children, however they come to grapple with it.

The Resistance of Family Members to the Use of Professionally-Prepared Educational Software (PPES)

On the other side of the ledger, the fieldnotes and reports suggest that there may be factors working against the use of PPES at home. One of these conditions is the possible resistance of parents and children to the kind of PPES to which they are exposed at school. This possibility is most strongly reflected in a field report that captures a mother's evaluation of the educational software she examined:

> ...Mo took a five week course at the junior high school where she teaches so that she might better familiarize herself with the family computer. The school had a Pet so the basic language was the same ...At her school Mo also had the opportunity to review computer educational software. The software she sees she evaluates as rote work; she would like to see software developed that would help students develop critical thinking...
> (E Report, p. 18)

The feelings of her teenage son are similar:

> At the high school Sn has used some of the educational software. The best program he encountered was a physics program on DC circuits, electromagnetic fields, vectors, and 'all sorts of stuff'. 'All this stuff cannot teach you. All it does is tell you whether you are right or wrong'.
> (E Report, p. 19)

The accuracy of the assessments this mother and son give to PPES is not as important as the fact that the materials are perceived to be inadequate. Actually, whether the assessments of others about the creative, cognitive, or social strengths of programming are accurate is not as important as the fact that programming is perceived to have them.

Other Possible Obstacles to PPES Use at Home

The extent to which low parental evaluations of existing PPES inhibit its home use in most families in this study, if at all, will require further content analysis of the logs and perhaps even more data collection to establish firmly. Future content analysis of logs and maybe more data gathering will be required to establish still other possible inhibitors as well. For example, there is a chance that the reason for lack of use is that effective PPES for home use -- PPES giving children a head start, the competitive edge, or greater insight into subjects at school -- is just not available and parents know this. Perhaps to some extent this is true, but the Q family was able to "dig some up." In fact, a lot of PPES exists and while not all existing PPES is effective, some of it -- maybe quite a bit of it -- can be used productively at home.

There are other hints in the logs that parents may be simply unaware of existing PPES for their children. Moreover, not too far fetched a reading of the logs suggests that many of these parents may also lack the ability to help their children, even if they had the best possible PPES at hand. This would be particularly true

for those who acknowledged that they know next to nothing about microcomputers to start with and care little about learning. Parents may also be unclear about how PPES could be used by their children. How, for instance, would its use be integrated with what is happening at school? Would it be integrated? Finally, even if there presently is effective PPES, the financial costs may be too high for some, if not the majority of parents. This may be particularly so for a family of two or three children, where each child needs to have the materials tailored to his or her learning needs, year at school, and teacher emphasis. The cost of PPES could be enormous for such families. Add this to the possibility raised earlier that available PPES is not acceptable to many parents and clearly the financial costs of serious attempted use of it in their homes may be just too high.

THE FAMILY-SCHOOL "PARTNERSHIP" IN AN EDUCATION SOFTWARE-SATURATED HOME ENVIRONMENT: SOME FINAL THOUGHTS

If these families are at all typical of those who will have home microcomputers and who will use them for educational microcomputing, the educational software R&D effort currently underway may fall on deaf ears, so to speak. For many reasons, this pessimistic possibility may not become a reality. So, assuming for the sake of discussion that the home market will continue to grow and prosper in the next years, and that the diffusion, adoption, and use of solid educational software in homes continues to grow as expected, what might happen to the home-school relationship? The log of the field-worker studying the K family suggests that the relationship may be in for some rough sledding, along with the probable beneficial educational outcomes that the use of this home software will have

for the children exposed to it.

In the first excerpt, the fieldworker had interviewed the daughter in the K family about her use of the home micro computer:

> Earlier when I was talking with her about school, I asked if she was going to do any of her work on the MC. She said no, the teacher said they couldn't because only about half the kids in the class had a MC and it wouldn't be fair to the kids that didn't since they would have to keep copying things over and the kids on the WP wouldn't.
> (K Log, p. 36.1-14)

Both parents in this situation were upset about the teacher's refusal to allow the home use of microcomputers for school work. Particularly disturbed about an incident related to their daughter and her teacher over a word processed paper on diskette that was damaged by an electrical storm, they simply refused to allow the teacher's decision to stand for their child. In essence they took the position that the teacher had no right to impose such a restriction. The upshot of this conflict was reflected when, at another point in time, the fieldworker questioned the daughter to see if any change or further development in their family-teacher disagreement had occurred:

> Da said, 'I'm a reporter for my newspaper' and told about a story she had done and how after she had written it she had only had to change a couple of words...on the computer and then print it out. She was very excited about this. I asked her again how often she used it and now she said every day. She said the problem is Daddy's always using it. I said, 'You use it for homework?' 'Yes'. 'I thought your teacher didn't want you to'. 'Tough...' Da said.
> (K Log, p. 72.72-80)

Many issues are embedded in this family's experience with the teacher and school over the daughter's use of the microcomputer at home for school-related purposes. First, to what extent can extensive home use of educational software be implemented by a family and in how many families of a school, without upsetting the existing home-school relations that exist? In the case of the K family, one of the underlying issues was, who had the authority to say whether the daughter could or could not use the micro in the way she was?

The parents, as reflected in the comments of their daughter, were saying that they would decide how their daughter was to successfully complete the assignment given by the teacher. One possible guess is that as parents come to invest more of their time, money, and energy into the adoption and home use of microcomputers and educational software by their children, some of the traditional lines of authority between teacher at school and parents at home may be challenged or disrupted.

A second issue, for some more important than the first, has to do with the desire of the K family to have their daughter do the best she could, to achieve her best, using the micro and its software. The teacher in this case was saying that because many children did not have home micros for educational use, it was unfair to allow some (including the K daughter) to use one. Purposeful or not, this stand in the name of equality of educational opportunity was denying the K family their adherence to the value of achievement. Put another way, this example shows how the use of micros and educational software at home might cause a clash between two cherished American values: achievement and equality of opportunity. While

families generally opt, when pushed, for the achievement of their children over the equality of educational opportunity of others, the school is responsible for trying to assure equality of educational opportunity for children, sometimes, at the expense of achievement. The problem witnessed in the excerpt may become pronounced as effective home educational software is developed, diffused, and used by families who can afford it. And, while strategies may be developing in order to alleviate the "inequities" caused by the early adoption of this innovation by the more affluent families, how ameliorative they are remains to be seen. One possibility is that as time passes, the inequities will grow, at least across some segments of the larger society. How typical the experience of the K family was within the families studied remains for further content analysis and data collection to determine.* How typical it is across the country, is another, critical question to answer.

In the years to come, this socio-technological ferment for education bears watching not only for the positive outcomes that may occur but also for those unanticipated, frequently undesired side effects that many innovations seem to produce regardless of their value. Part of the commitment at NYU is to the longitudinal, indepth study of families, school, and the relationship between them as this enormously important breakthrough in machines and materials continues to evolve. It promises to be an exciting watch.

*See the excerpts on the J and E families, pp.12 and 6 respectively.

FOOTNOTES

[1] I wish to express my deep appreciation to the twenty doctoral students whose field research formed the basis of this paper: S. Aneiro; M. Barnett; S. Benesch; E. Blaustein; B. Danish; H. Friedman; P. Lane; M. Lefton; R. Lizzul; D. Moinester; N. Oliver; P. Peknik; R. Plotz; L. Sanger; P. Schall; S. Scher; R. Schine; A. Smaller; D. Sokoll; L. Watkins; and to Professors Margot Ely and Trika Smith-Burke without whose continued support and help in reading field logs and conducting weekly small-group meetings of the fieldworkers, this study would not have been possible.

[2] For current discussions of the pros and cons of using microcomputers at home and in the school see the following: A. Benderson, "Computer Literacy," Focus II (1983), Educational Testing Service, pp. 1-32; J. Hollifield, "In Reality, High Tech Means Low Skills, Poor Pay," Educational R & D Report, 6:1 (Fall, 1983):3-5; A. Lareau & C. Benson, "The Economics of Home/School Relationships: A Cautionary Note," Phi Delta Kappan, 65:6 (February, 1984):401-404; J. Levine, "A Computer in the Family," Parents, 58:7 (July, 1983):53-58; J. Menosky, "Computer Worship," Science, 84 (May, 1984):40-46; P. Morrisroe, "Living with the Computer," New York, 17:2 (January 9, 1984):22-31; R. Taylor (ed.), The Computer in the School, (New York: Teachers College Press, 1980); A. Toffler, The Third Wave (West Caldwell, N.J.: Morrow & Co., 1980); P. Trachtman, "Putting Computers into the Hands of Children Without Language," Smithsonian, 14:11 (February 1984):42-51; S. Turkle, The Second Self, (New York: Simon and Schuster, 1984); H. Ullman, "False Notions About Computers," NY Times, Op Ed Page, (January 13, 1984); D. Walker, "Reflections on the Educational Potential and Limitations of Microcomputers," Phi Delta Kappan, 65:2 (October, 1983):103-107.

[3] The definition of "family" for this research is similar to the one employed by the U.S. Census Bureau: "Two or more persons residing together who are related by blood, marriage, or adoption." See Catherine Allen, "Defining the Family for Post-Industrial Public Policy," in D. Snyder (ed.), The Family in Post Industrial America, (Washington, D.C.: American Association for the Advancement of Science, 1979), pp. 21-36.

[4] For several excellent and recent discussions of the adoption and use of technological innovations, see: E. Rogers, Diffusion of Innovations, (New York: Free Press, 1983, 3rd ed.), and L. Tornatzky et al., The Process of Technological Innovation: Reviewing the Literature, (Washington, D.C.: National Science Foundation, 1983).

[5] The following three references reflect classical and current thinking about the impact of technology on the family: W.J. Goode, World Revolution and Family Patterns, (New York: Free Press, 1963); W. Ogburn and M. Nimkoff, Technology and the Changing Family, (Boston: Houghton Mifflin, 1955); and R. Winch, Familial Organization: A Quest for Determinants, (New York: Free Press, 1977).

6

Three of the most recent treatments of this research topic are: R. Herriott and W. Firestone, "Multisite Qualitative Policy Research: Optimizing Description and Generalizability," Educational Researcher, 12:2 (February 1983):14-19; M. Miles and A. Huberman, "Drawing Valid Meaning from Qualitative Data: Toward a Shared Craft," Educational Researcher, 13:5 (May 1984):20-30; and, M. Miles and A. Huberman, Qualitative Data Analysis: A Sourcebook of New Methods, (Beverly Hills, CA: Sage, 1984).

7

Microcomputing is used in this paper to refer to a general type of innovative activity: a person's use of a self-contained machine (based on the microprocessor) with a video display and programs (software) in order to engage in certain tasks such as communicating with others, creating software, doing statistical analyses, playing games, retrieving information from a data bank, and writing papers. Home, educational microcomputing for this paper refers to the use of a personal or microcomputer and relevant software by children at home in order to (1) develop skills or knowledge and understanding of subjects that are, for the most part, associated with school, or (2) engage in other activities purposefully related to achievement at school.

8

In doing these case studies, each field researcher used some common ethnographic techniques: participant observation, informal interviewing, and log development and analysis. Each was asked to find a family with whom they had no social ties, preferably strangers. The use of friends-of friends, school contacts, and even computer store recommendations led to the selection of families who were unknown to most fieldworkers prior to their case studies. The few instances where the family was known to the researcher (one, more than casually) were carefully examined at the onset and during the data collection period to make sure that their familiarity would not bias what they saw or asked.

Although the majority of fieldworkers were able to gain entree and establish rapport with their family of first choice, there were several who had a false start or two. By the middle of February, however, all (1) had made contact with "their" family, (2) explained that they were part of a research effort at NYU to study the effects of microcomputers on families, and (3) were embarking on their first field visits.

The number of visits, the duration of these visits, and the data collection and analysis of information varied. However, all were in contact with their families in some way from February throughout April and many into the early part of May, 1984. Some of the researchers followed children to school or other settings to examine their out-of-home computer activities. A log of observations, interview responses and personal reactions was kept by each. These logs were updated as new observations and interviews were recorded. The author and two other professors divided the task of reviewing new entries and providing feedback.

The fieldworkers met on a weekly basis in small groups to discuss their problems and progress. These small groups acted as supports for when

activities were particularly stressful and helped give direction to next fieldwork activities. The three-month, indepth search and description of twenty families with children and microcomputers led to nearly 2000 pages of log material and its summary and analysis on an individual case-by-case basis. The individual case analyses were shared by the researchers with their families, some in writing and some verbally. The effort was made to get their reactions to the accuracy of the findings or interpretation and to uncover new information in the course of sharing the preliminary results with members of the families.

It is hoped that follow-up interviews with the families in late October, 1984 and January, 1985 (more systematic and structured across families) will be possible, in order to get additional information judged to be important as the analyses of the cases continue both individually and comparatively. Such longitudinal work will also shed light on whether important changes have taken place since the first fieldwork with these families was completed.

9

Perhaps the most basic possible explanation is that the children in these families did not need to use professionally-prepared educational software. It is true that the logs show many of them to be highly talented in many areas and excellent students as well. On the other side, some were very mediocre as students and most seemed to be normal, middle class children having educational needs that could have been met had they been properly exposed to PPES.

10

See, for example, M. Fullan, The Meaning of Educational Change, (New York: T.C.Press, 1982); E. Glaser, H. Abelson and K. Garrison, Putting Knowledge to Use, (San Francisco: Jossey-Bass, 1983); P. Goodman and Associates (eds.) Change in Organizations, (San Francisco: Jossey-Bass, 1982); and N. Gross, J. Giacquinta, and M.Bernstein, Implementing Organizational Innovations, (New York: Basic Books, 1971).

11

For reports of two recent and extensive studies of microcomputer usage in schools, see: K. Sheingold, J. Kane, and M. Endreweit, "Microcomputer Use in Schools: Developing a Research Agenda," Harvard Educational Review, 53:4 (November 1983):412-432; and "School Uses of Microcomputers," Center for Social Organization of Schools, The Johns Hopkins University, Issue Number 3 of Reports from a National Survey (October, 1983).